Trade liberalization and gender inequality: role of social norms
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Abstract
Purpose – The purpose of this paper is to examine the effects of trade liberalization on gender earning differentials and female labour force participation by considering the interaction between changes in relative wages, intra-household bargaining power and social norms.

Design/methodology/approach – A three-sector general equilibrium model is developed where female labour supply is determined as a collective household decision and depends on male and female wages and intra-household power distribution. On the other hand, the effect of power distribution on female labour supply depends on social norms.

Findings – Comparative static analysis shows that a tariff cut may reduce female labour force participation and widen gender earning inequality if (i) the agricultural sector is more male labour-intensive than the informal sector, and the marginal utility of the woman from household work is higher than that of the man or (ii) the agricultural sector is more female labour-intensive than the informal sector, and the marginal utility of the woman’s household work is higher to the man than the woman. Policies to raise the empowerment of women might lead to favourable labour market outcomes for women if the marginal utility of the woman’s household work is higher to the man than the woman irrespective of the factor intensity condition.

Research limitations/implications – The results signify that the effect of trade liberalization hinges on both factor intensity conditions and the relative work preferences of women vis-à-vis men, which in turn is shaped by social norms.

Originality/value – The paper contributes to the scant theoretical literature on labour market consequences of trade liberalization by considering the gender equality implications of trade liberalization from a supply side perspective. The results of the model are used to explain the recent gendered labour market consequences in India in the aftermath of trade liberalization.

Keywords Social norm, Female labour force participation, Gender earning differential, Intrahousehold power distribution

Paper type Research paper

Introduction
The development trajectory of developing countries is seriously constrained due to the perpetuation of gender inequality in the labour market in the form of wage and earning gaps and a lower labour force participation rate for women compared to men. Average wages for women are between 4 to 36 per cent less than that of men (ILO's Global Wage Report 2014/2015). According to World Bank data, the average gender wage differential in India was 24.85 per cent in 2009-2010. On the other hand, the global female labour force participation rate was only 49.6 per cent in 2015, with the gender gap being around 27 per cent (ILO, 2016). The Report on Global Employment Trends (ILO, 2013) asserts that in South Asia,
labour force participation for men is about 80 per cent while that of women is only 32 per cent. As per World Bank (2013), among the BRICS (Brazil, Russia, India, China and South Africa) which are comparable emerging economies, India has the lowest female participation rate, with only 29 per cent of women over the age of 15 working.

The dynamics of gendered difference in labour force participation and earnings have undergone significant changes consequent to the worldwide sweep of trade liberalization. Standard trade theory based on the Heckscher–Ohlin model predicts that as developing countries are abundant in unskilled (female) labour, trade liberalization would expand the sectors intensive in female labour and pull up female wages, thereby narrowing the gender wage gap. On the other hand, the existing literature argues that increased openness leads to an increase in female labour force participation (FLFP) in developing countries through several interconnected channels. Due to prevalent gender discrepancies, exporting and multinational firms are more likely to employ women, especially as most tasks of industries where developing countries have a comparative advantage are less skill-intensive or a priori are expected to be female-intensive (Çağatay and Berik, 1990; Anderson, 2005). Female labourers are preferred over male labourers because women are considered to be “docile” workers, who are willing to work at wages lower than men would accept and in conditions that unions would not permit. Even if male-intensive sectors benefit most from increased openness, FLFP may rise in equilibrium as men might leave female-intensive industries to take up new jobs in the export sector, thereby opening up employment opportunities for women (Sauré and Zoabi, 2009).

However, empirical evidence suggests that the effects of trade expansion and liberalization for women have been mixed. Seguino (2000) in a study of Taiwan shows that greater mobility of capital in female labour-intensive sectors leaves women workers more vulnerable to losses of bargaining power in wage negotiations. In Bangladesh, the narrowing of the gender wage gap was observed from 1983 to 1990, but a widening from 1990 onwards has been attributed to a higher proportion of men taking up high skilled jobs and an increase in the number of temporary workers among women (Paul-Majumder and Begum, 2000). Berik (2000) finds that greater export orientation in Taiwan after 1980 was associated with a greater reduction in employment opportunities for women compared to men. Menon and Rodgers (2009) find that in India, policy reforms like licencing deregulation and tariff reductions have increased competitive forces in the manufacturing industries and weakened the bargaining power of women, leading to a widening of the wage gap. In Mexico, the findings by Hazarika and Otero (2004) indicate that trade-induced competition in product markets is associated with lower gender earnings differentials. Using a sample of sixteen countries, Behrman and King (2002) similarly find that competitive pressures from international trade are a source of narrowing gender wage inequality. Oostendorp (2009) shows that increased trade is associated with reduced wage gaps, but the opposite result is obtained for the case of highly-skilled workers in lower-income economies. Chamarbagwala (2006) finds that international trade in manufactures have benefitted skilled men but hurt skilled women, whereas outsourcing of services has generated a demand for both female and male college graduates.

Çağatay and Berik (1990); Kabeer and Mahmud (2004) and Pradhan (2006) find that developing countries where trade liberalization has been marked by export-led industrialization have been successful in mobilizing large numbers of low-paid women workers and experienced relatively more surge in female labour. However, recent shifts to skill-intensive forms of production have jeopardized employment opportunities for women in export-oriented industries, leading to “defeminisation” of manufacturing labour force on
the one hand and aggravating gender based occupational segregation, leaving behind women in low-skilled and low-paid jobs (Seguino, 2000; UNCTAD, 2010).

Although a number of empirical studies have been carried out with respect to effects of liberalization, few theoretical studies exist in this regard. Mukhopadhyay and Chaudhuri (2013) examine the effects of a tariff cut and foreign capital inflow on the gender wage gap in a model where efficiencies between male and female labour are different because of skewed access to resources and differences in their spending patterns. Mukhopadhyay (2015) considers endogenous female labour supply decisions and studies the impact of a tariff cut, foreign capital inflow and labour market deregulation on gender wage gap and female labour force participation.

World Bank data (2017) suggests that FLFP in India dropped from 42.6 to 31.2 per cent during 1993-1994 to 2011-2012. This decline in FLFP has often been attributed to education and income. Rangarajan and Iyer Kaul (2011) showed that this decline has been due to rising participation in education among young females. Himanshu (2011); Kannan and Raveendran (2012) and Thomas (2012) suggest that an overwhelming proportion of women dropped out of the labour force due to improvement in economic conditions leading to higher incomes. Abraham (2013) argued that withdrawal of women from the labour force with income rise in India is aimed at reducing the double burden of work and enabling women to act in conformity to the patriarchal norms of being invisible in paid work. In 2011-2012, 35.3 per cent of all rural females and 46.1 per cent of all urban females in India were reported to be attending to domestic duties (Chaudhary and Verick, 2014). That is, social orthodoxy may be another reason for withdrawal, implying that supply side factors do play a major role in determining FLFP in developing countries, including India.

Three pertinent phenomena are to be noted with regard to female labour force participation in developing countries, including India. First, gender stereotypes perpetuated through social norms assign women to unpaid domestic and reproduction roles with the primary responsibility of performing household chores and caregiving in the family. These act as major barriers to labour force entry and to retention of employment for married women. Second, other social factors like patriarchal values and social stigma related to outside work have substantial effect on female labour force participation (Sarkar, 2008). ILO (2013) has recognized that low female participation rates in South Asia are largely due to cultural attitudes and social norms about women in the workplace[1]. Women in conservative and traditional societies where men have higher decision power, and which have stronger social norms, tend to stay at home. Social norms and patriarchal values lead to part time work arrangements being predominantly a female domain that even perpetuate gender roles (ILO, 2017). Third, there is considerable empirical evidence suggesting that households’ resource allocation decisions are made in a “collective” or bargaining framework (McElroy and Horney, 1981; Chiappori, 1988) where the time allocation of work usually depends on the bargaining power of the members of the household. The importance of labour income as a determinant of women’s bargaining power within the household has been highlighted recently by Anderson and Eswaran (2009). Basu (2006) recognizes a two-way relationship between household choice and balance of power between husband and wife. Atal (2011) considers the interaction between the nature of female power within the household and the nature of female labour supply.

The above issues are particularly important if differences of earnings across gender are considered. As earnings take into account both wages and the time allocated for work, the issues of female labour force participation and women’s earning are intertwined. Apart from wage inequality across gender, the earnings between men and women tend to be unequal
mainly due to women being engaged in contractual or part-time jobs or lower labour hours in paid jobs.

The existing studies on trade and gender have based their studies on the demand side effects of liberalized policies implying that in developing countries the supply of labour is demand determined. However, based on the stylized facts and arguments given above, it may be asserted that female labour force participation depends on both cultural and institutional factors. Trade liberalization policies are likely to bring about changes in relative wages and alter the power distribution within the household. The latter in conjunction with social norms have direct as well as indirect effects on women’s labour force participation. A change in the FLFP, if substantial, might affect female wages and earnings as well. It might be interesting to examine whether the interaction between demand and supply side aspects have any role in gendered labour market outcomes in India. Also, while a large literature exists on gender wage inequality, differences in earning across gender have not received adequate attention.

The objectives of the paper are threefold:

- first, to consider both the demand-side and supply-side aspects of female labour force participation as a result of trade liberalization;
- second, to examine its effect on the gender earning gap, as the latter reflects not only the disparity in wages but difference in participation in labour market across gender as well; and
- third, to explain the recent gendered labour market consequences in India in the aftermath of trade liberalization.

A three-sector full employment general equilibrium model is developed to examine the effects of trade liberalization on gender earning differentials and female labour force participation by incorporating the interaction between changes in relative wages owing to liberalized trade and changes in women’s intra household bargaining power thereof and the prevailing social norms. The paper then tries to provide an explanation for the declining FLFP in India in the post liberalization regime on the basis of the comparative static results.

The model
A full employment small open economy is considered to consist of three sectors – two informal sectors and one formal sector, operating in close vicinity. Sector 1 is the informal agricultural sector that uses male labour (M), female labour (F) and capital (K) to produce the agricultural good, $X_1$. Sector 2, another informal sector, produces a manufacturing good, $X_2$ with male labour, female labour and capital. Sector 3 is the formal sector that produces a manufacturing good, $X_3$ with male labour, female labour and capital. It is assumed that Sector 1 and Sector 2 are the export sectors, while Sector 3 is the tariff-protected import competing sector. Male and female workers earn different wages, denoted by $W_M$ and $W_F$, respectively, in the informal sectors. The formal sector labour market is imperfect as the male wage in the sector, $\bar{W}$ is determined institutionally. All the other markets are perfectly competitive and all inputs are fully employed. Despite wage rigidity in the formal sector, there is no unemployment as those unable to seek jobs in the formal sector are absorbed in the informal sectors. Owing to the assumption of a small economy, commodity prices are internationally given. Production functions exhibit constant returns to scale with diminishing marginal productivity to each factor. The price of commodity 1, $P_1$ is considered to be the numeraire.

The following symbols are used in the formal presentation of the model.
Female labour supply function

To derive the female labour supply function, I follow the collective utility model as developed by Basu (2006) and Atal (2011) but with some modifications. It is assumed that there are $N$ identical households in the economy. A representative household consists of two adults, a male ($M$) and a female ($F$), each of them having different utility functions, but the decision on supply of female labour is determined collectively. The household maximizes a weighted average of the two utility functions, with the weights capturing the distribution of power in the household. Let $\delta \in (0, 1)$ denote the power of the woman in the household, so that $(1 - \delta)$ is the power of the man. Now let $e \in (0, 1)$ denote the woman’s effort to paid work outside home and $h \in (0, 1)$ be her effort on household work, with $(e + h) = 1$. It is assumed that while $\delta$ influences the collective decision on $e$, the latter in turn influences $\delta$. The woman may gain more power due to increases in her relative income from wages or favourable changes in social and cultural factors; on the other hand, more power implies that she can choose to do more of whatever she likes—outside job or household work. Hence, the index of power is endogenous to the household. To focus on female labour supply, it is assumed that the man always puts in effort 1 for outside work.

Let $W_F$ and $W_M$ be the market wage rates for female and male labour, respectively, and $I$ be the non-labour income of the household. Let $V_F$ and $V_M$ denote the utility derived by the woman and the man respectively from the household work done by the woman. Assume $V'_F(\cdot) > 0$ and $V''_F(\cdot) \leq 0$ for $i = M, F$. Let $C_i(\cdot)$ denote the disutility due to work (at home and outside) by $i$, for $i = M, F$, where $C'_i(\cdot) > 0$ and $C''_i(\cdot) \geq 0$. It is assumed that $V'_F(1) > C_F(1)$, which implies that the woman’s marginal utility exceeds her marginal disutility from her work at home and ensures that the optimum choice of $e$ by the household is such that $h > 0$ and $(e + h) = 1$.

Let $\alpha$ denote the woman’s disutility from an outside job in terms of household work, i.e. the pain from working for one hour outside is equivalent to the pain from working $\alpha$ hours in the household, where $\alpha > 1$. As working at home or outside are perfectly substitutable choices for the woman, $\alpha$ works as a preference parameter here.

Now the utility functions of the woman and the man in a representative household depends on their consumption of the three goods, denoted by $D_1, D_2, D_3$ and household work, $\left(1 - e\right)$. However, their preferences are different and can be expressed as the following, respectively:

$$U_F = \left(\alpha_F \log D_1 + \beta_F \log D_2 + \gamma_F \log D_3\right) + V_F(1 - e) - C_F(1) - \alpha e$$  \(1\)

$$U_M = \left(\alpha_M \log D_1 + \beta_M \log D_2 + \gamma_M \log D_3\right) + V_M(1 - e) - C_M(1)$$  \(2\)

The household maximizes its collective utility, $U_{H}$, which is given as the weighted average of the utilities of the man and the woman, the weights being their respective power in the household, subject to the budget constraint that the total expenditure on final commodities
equals the sum of total wage income of the man and the woman as well as their non-wage income. Hence the household’s utility function is given by:

\[ U_H = \delta U_F + (1 - \delta) U_M \]

\[ = \delta \left[ (\alpha_F \log D_1 + \beta_F \log D_2 + \gamma_F \log D_3) + V_F (1 - e) - C_F ((1 - e) + \alpha e) \right] \]

\[ + (1 - \delta) \left[ (\alpha_M \log D_1 + \beta_M \log D_2 + \gamma_M \log D_3) + V_M (1 - e) - C_M (1) \right] \]  

(3)

The budget constraint of the household (where the man is employed in the informal sector) is expressed as:

\[ D_1 + D_2 P_2 + D_3 P_3^* = W_M + e W_F + I \]  

(4)

Maximization of equation (3) with respect to \( D_1, D_2, D_3 \) and \( e \) subject to the budget constraint given by equation (4) yields the following first order conditions:

\[ \left[ \{ \delta \alpha_F + (1 - \delta) \alpha_M \}/D_1 \right] = \left[ \{ \delta \beta_F + (1 - \delta) \beta_M \}/D_2 P_2 \right] = \left[ \{ \delta \gamma_F + (1 - \delta) \gamma_M \}/D_3 P_3^* \right] \]

\[ = \left[ \delta \{ (\alpha - 1) C_F ((1 + (\alpha - 1)e)) + \delta V_F(1 - e) + (1 - \delta) V_M' (1 - e) \}/W_F \right] \]

(5)

The following expressions can be derived from equation (5).

\[ D_1 = \left[ \{ \delta \alpha_F + (1 - \delta) \alpha_M \}/W_F \right]/\left[ \delta \{ (\alpha - 1) C_F ((1 + (\alpha - 1)e)) \}

+ \delta V_F' (1 - e) + (1 - \delta) V_M' (1 - e) \]  

(6)

\[ D_2 = \left[ \{ \delta \beta_F + (1 - \delta) \beta_M \}/W_F \right]/P_2 \left[ \delta \{ (\alpha - 1) C_F ((1 + (\alpha - 1)e)) \}

+ \delta V_F' (1 - e) + (1 - \delta) V_M' (1 - e) \]  

(7)

\[ D_3 = \left[ \{ \delta \gamma_F + (1 - \delta) \gamma_M \}/W_F \right]/P_3^* \left[ \delta \{ (\alpha - 1) C_F ((1 + (\alpha - 1)e)) \}

+ \delta V_F' (1 - e) + (1 - \delta) V_M' (1 - e) \]  

(8)

Substitution of the values of \( D_1, D_2 \) and \( D_3 \) into the budget constraint and further simplification gives the following female labour supply function as follows:

\[ e = \left[ 1/\left[ \delta \{ (\alpha - 1) C_F ((1 + (\alpha - 1)e)) + \delta V_F' (1 - e) + (1 - \delta) V_M' (1 - e) \} \right] \]

\[ - \{(W_M + I)/W_F\} \]

(9.1)

In a household where the man is employed in the formal sector and earns \( W_M \), female labour supply function is modified as:
Hence the household utility maximizing aggregate supply of female effort can be obtained as:

\[ e = e(\delta, W_F, W_M) \]  

(10)

As the market wage-rate \( W_F \) reflects the price of working one hour at home for the woman, with a rise in \( W_F \), she will be willing to work more outside. This can be called the “substitution effect” and hence \( e_2 = (\partial e / \partial W_F) > 0 \). On the other hand, a fall in \( W_M \) reduces the household income and produces an effect analogous to the income effect. Thus, \( e_3 = (\partial e / \partial W_M) < 0 \).

There is a “power effect” as well, which captures the response of female labour supply due to changes in power. There may be two different cases in this respect:

- **Case (i)**: if \( V_0 F > V_0 M \), then the marginal utility of the woman from household work is higher than that of the man. Hence, if \( \delta \) rises, \( e \) should fall for equation (9.1) to hold, and \( e_1 = (\partial e / \partial \delta) < 0 \).
- **Case (ii)**: if \( V_0 F < V_0 M \), it depicts the case where the man’s marginal utility of the woman’s household work is higher. Here, if \( V_F < V_M \) when \( \delta \) rises, \( e \) should rise as well [equation (9.1)]. Hence \( e_1 = (\partial e / \partial \delta) > 0 \).

Here the relative marginal utilities from the woman’s household work are shaped by social norms. In particular, Case (ii) depicts the society where there is a social stigma attached to women’s outside work and men derive higher satisfaction if women perform domestic activities only.

Now the woman can acquire more power by earning more, implying that her power, \( \delta \) depends positively on her effort on paid work (e) and female wages relative to that of men \((W_F/W_M)[4]\). \( \delta \) also depends on her unearned income like inherited wealth, increased employment opportunities, etc., that can be captured by the policy parameter (\( \delta \)) that includes favourable amendment of inheritance laws, employment guarantee schemes and so on. Therefore, the woman’s power function can be expressed as:

\[ \delta = \delta(e, (W_F/W_M), \delta); \delta_1 > 0, \delta_2 > 0, \delta_3 > 0 \]  

(11)

Using equation (11), equation (10) can be rewritten as:

\[ e = e(\delta(e, (W_F/W_M), \delta), W_F, W_M); e_1 > (\leq)0, e_2 > 0, e_3 < 0 \]  

(10.1)

From equation (10.1) it is evident that a rise in \( W_F \) or fall in \( W_M \) produces an income effect and pulls the female labour supply upwards. If relative female wages rise, their power in the household also increases. However, if the marginal utility of the woman from household work is higher than that of the man, she lowers her supply of labour with higher bargaining power. The income effect and power effect work in opposite directions and the effect on female labour supply is determined by the relative strengths of the two forces. On the other hand, if the marginal utility of the woman’s domestic work is higher to her husband than herself, that is, the woman prefers working outside more than the man likes her job, then with higher bargaining power, she prefers to work more. In this case, the power effect reinforces the income effect and raises the female labour supply.

The general equilibrium is represented by the following set of equations:
Equations (12) - (14) depict the usual price-unit cost equality conditions in the three sectors of the economy operating in perfectly competitive markets, respectively. Here, \( a_{Ki} \) denotes the capital-output ratio in the \( i \)th sector, \( i = 1, 2, 3 \); \( a_{Mi} \) is the male labour-output ratio in the \( i \)th sector, \( i = 1, 2, 3 \); \( a_{Fi} \) denotes the female labour-output ratio in the \( i \)th sector, \( i = 1, 2, 3 \); \( WM \) is the competitive wage rate of male labour in the informal sectors; \( WF \) is the competitive female wage rate; \( W \) denotes the institutionally fixed male wage rate in Sector 3; \( r \) is the return to capital.

Complete utilization of male labour and capital respectively, implies:

\[
a_{Mi}X_1 + a_{M2}X_2 + a_{M3}X_3 = N \tag{15}
\]

\[
a_{K1}X_1 + a_{K2}X_2 + a_{K3}X_3 = K \tag{16}
\]

Here, \( X_i \) denotes the output level of the \( i \)th sector, \( i = 1, 2, 3 \); \( N \) and \( K \) are the endowments of male labour and capital respectively.

Using equation (10.1) one has:

\[
a_{F1}X_1 + a_{F2}X_2 + a_{F3}X_3 = Ne(\delta (e, (W_F/W_M), \overline{\delta}), W_F, W_M) \tag{17}
\]

Here it is assumed that \( N \) is the number of female labour (due to the assumption that there are \( N \) households with a male and a female member each); \( e \) is the woman’s effort to paid work outside home; and \( \delta \) denotes the power of the woman in the household.

There are eight endogenous variables: \( WM, WF, r, X_1, X_2, X_3, e \) and \( \delta \) that can be solved from equations (10) - (17). This is a decomposable system, where factor prices can be solved from the price system alone.

Let us assume that the informal sector is more capital-intensive than the agricultural sector (with respect to both male and female labour) in both physical and value terms. This implies that \((\lambda_{M1} + \lambda_{F1})\lambda_{K2} > (\lambda_{M2} + \lambda_{F2})\lambda_{K1}\) and/or \((\theta_{M1} + \theta_{F1})\theta_{K2} > (\theta_{M2} + \theta_{F2})\theta_{K1}\). However, Sector 3 is the most capital-intensive sector. Besides, for the sake of analytical simplicity it is considered that the capital-output ratio in Sector 1 \( (a_{K1}) \) is constant.

**Comparative static exercises**[5]

In this section, the effects of trade liberalization in the form of tariff cut on female labour force participation and earning inequality between male and female workers are examined. As male labour earns \( WM \) in the informal sector and \( \overline{W} \) in the formal sector, the average male wage is given by:

\[
W_A = (1/N)[W_M(a_{M1}X_1 + a_{M2}X_2) + \overline{W}a_{M3}X_3] = W_M + (\overline{W} - W_M)\lambda_{M3} \tag{18}
\]

There is a difference in the effort level, that is, the time spent on the paid job, between male and female labour, with the latter being typically lower. Hence the appropriate measure of earning inequality between male and female labour is given by:

\[
W_I = W_A - W_Fe = W_M + (\overline{W} - W_M)\lambda_{M3} - W_Fe \tag{19}
\]
Effect of a reduction in tariff rate

The effects of a reduction in the rate of import tariff are examined under two alternative factor intensity conditions:

- Let us assume that Sector 2 is more female-labour intensive than Sector 1 with respect to male labour, which implies that $\theta_{M1} \theta_{F2} > \theta_{F1} \theta_{M2}$.

Due to a tariff reduction, the domestic price of $X_3$ falls and hence Sector 3 contracts, releasing labour of both types and capital. As it has been earlier assumed that Sector 2 is more capital intensive vis-à-vis Sector 1, that is, $(\theta_{M1} + \theta_{F1}) \theta_{K2} > (\theta_{M2} + \theta_{F2}) \theta_{K1}$, there is an expansion in Sector 2. But as the latter is more female labour intensive, Sector 1 contracts to provide the required female labour. Male labour is also released, but as Sector 1 (Sector 2) is more male (female) labour intensive, $W_M$ falls and $W_F$ rises. There is an increase in the relative female-male wage ($W_F/W_M$), which leads to a rise in the power of women in household ($\delta$). The consequence on the effort level of women depends on their power effect, that is, their marginal utility from domestic work vis-à-vis men.

**Case I (Marginal utility of the woman’s household work is higher to the man than the woman):** If $e_1 > 0$, the effort level of women workers ($e$) rise, implying an increase in female labour force participation. Now if $\theta_{F2}(\theta_{M1} + \theta_{K1}) > \theta_{F1}(\theta_{M2} + \theta_{K2})$, that is, Sector 2 is more female labour intensive (with respect to male labour and capital) vis-à-vis Sector 1, there is an expansion in Sector 2. The additional male labour required for expansion in Sector 2 is provided by contraction in sector 1. But as Sector 1 is more male labour intensive (with respect to female labour) than Sector 2, only a part of the male labour released is absorbed in Sector 1. The rest is absorbed by Sector 3 and it expands. Hence, Sector 3 initially contracts but subsequently expands. The former effect is stronger under the sufficient condition (A.18). From equation (19), it is evident that the effect on male–female income inequality ($WI$) depends on:

- informal male wages;
- changes in the sectoral composition;
- female wages; and
- effort of female workers.

In this case, $W_M$ falls, $W_F$ rises, $e$ rises and the higher male wage paying Sector 3 contracts. Hence the gender earning differential diminishes.

**Case II (Marginal utility of the woman from household work is higher than that of the man):** If $e_1 < 0$, there are two opposing effects on the effort level of women: first, there is an increase in $e$ due to a rise in $W_F$ and a fall in $e$ due to rise in $\delta$. If the latter effect is stronger [as depicted by equation (A.21)], women’s labour force participation declines. Gender earning differential accentuates if female participation effect outweighs the other effects as depicted in equation (A.22).

This leads to the following proposition:

**P1.** Due to a tariff cut in an economy where the agricultural sector is more male labour intensive than the informal sector, intra-household power of women rises, female labour force participation may rise and gender earning inequality may fall if the man’s marginal utility of the woman’s household work is higher, while female labour force participation may fall and gender earning inequality may get aggravated if the marginal utility of the woman from household work is higher than that of the man.
Now let us consider the other alternative factor intensity condition, that is, Sector 1 is more female labour-intensive than Sector 2 with respect to male labour, which implies that \( \theta_{M1} \theta_{F2} < \theta_{F1} \theta_{M2} \).

In this case too, a tariff cut leads to expansion in Sector 2 as explained in the previous case. However, as now Sector 2 (Sector 1) is male (female) labour intensive, \( W_M \) rises and \( W_F \) declines. The relative female-male wage \( (W_F/W_M) \) falls and lowers the power of women in household \( (\delta) \).

**Case I (Marginal utility of the woman’s household work is higher to the man than the woman):**

If \( e_1 > 0 \), the effort level of women workers \( (e) \) falls and female labour force participation falls. Sector 1 contracts (as it is more female labour intensive than Sector 2) and releases male labour and capital. Now it is also more labour (male and female) intensive than Sector 2 with respect to capital so that the released labour leads to an expansion in both Sectors 2 and 3. Hence, Sector 3 initially contracts but subsequently expands due to the female labour force participation effect. The former effect outweighs if condition [equation (A.23)] holds. The gender earning differential gets aggravated under the sufficient condition depicted in equation (A.25).

**Case II (Marginal utility of the woman from household work is higher than that of the man):**

If \( e_1 < 0 \), there are two opposing effects on the effort level of women: first, a fall in \( e \) owing to a decline in \( W_F \) and an increase in \( e \) due to fall in \( \delta \). If the latter effect is stronger [as depicted by equation (A.27)], the women’s labour force participation increases. Gender earning differentials narrow down due to the favourable effects of \( W_M, W_F, e \) and \( X_3 \).

**P2.** A reduction in the tariff rate in an economy where the agricultural sector is more female labour intensive than the informal sector may lead to a decline in intrahousehold power of women, a fall in female labour force participation and widening of gender earning inequality if the marginal utility of the woman’s household work is higher to the man than the woman; and increase in female labour force participation and shrink in gender earning inequality if the marginal utility of the woman from household work is higher than that of the man.

**Effects of exogenous rise in power of women**

Let us consider the case when power escalates due to exogenous reasons (may be public-policy induced), like favourable amendment of inheritance laws, employment guarantee schemes, etc., which implies that \( \delta \) rises.

Analogous to the previous section, the effects of rise in power of women are examined under two alternative factor intensity conditions:

- Let us assume that sector 2 is more female labour-intensive than sector 1 with respect to male labour, which implies that \( \theta_{M1} \theta_{F2} > \theta_{F1} \theta_{M2} \).

As this is a decomposable system, an increase in \( \delta \) does not affect wages, so that the relative female-male wage \( (W_F/W_M) \) remains unchanged. However, power of women, \( \delta \) rises.

**Case I (Marginal utility of the woman’s household work is higher to the man than the woman):**

If \( e_1 > 0 \), the effort level of women workers \( (e) \) rises and female labour force participation increases. The latter reinforces the initial rise in bargaining power of women. As Sector 2 is more female labour intensive than Sector 1, the former expands. The additional male labour and capital required is released by contraction in sector 1. However, as Sector 2 is more capital-intensive (with respect to male and female labour) vis-à-vis sector 1, the capital released by sector 1 is inadequate and induces contraction in Sector 3. The average male wage declines due to fall in employment in Sector 3, while the female earning rises due to increase in effort. Hence the difference in wage earning narrows down.
**Case II (Marginal utility of the woman from household work is higher than that of the man):** If $e_1 < 0$, there is a decline in the female effort and labour force participation rate, leading to contraction in Sector 2. Male labour and capital released are absorbed by expansion in Sectors 1 and 3. As the higher wage paying sector expands, average male wage rises. On the other hand, the fall in $e$ lowers the female earning, aggravating the gender earning differential. The bargaining power of women rises if the effect due to initial exogenous increase in power outweighs the negative effect due to fall in effort level.

**Case I (Marginal utility of the woman’s household work is higher to the man than the woman):** If $e_1 > 0$, the effort level of women workers ($e$) rises and female labour force participation increases, which strengthens the power of women. Sector 1 expands (as it is more female labour intensive) and Sector 2 contracts. However, as Sector 2 is more capital intensive than sector 1, the capital released is more and hence leads to an expansion in Sector 3. Expansion in the high wage paying sector raises the average male earning while female earning also rises. Gender wage inequality falls if the latter effect is stronger, under the sufficient condition as depicted in equation (A.30).

Thus, the following proposition can be established:

**P3.** An increase in power of women in an economy due to exogenous factors may lead to a rise in intrahousehold power of women; a rise in female labour force participation and a fall in gender earning inequality, if the marginal utility of the woman’s household work is higher to the man than the woman; and a fall in female labour force participation and a worsening in gender earning inequality, if the marginal utility of the woman from household work is higher than that of the man.

**Concluding remarks**

The paper examines the effects of trade liberalization on gender earning differential and female labour force participation by taking into account the interaction between changes in relative wages due to liberalized trade, changes in women’s intra household bargaining power thereof and the relative work preference of women *vis-à-vis* men. A three-sector general equilibrium model appropriate for a developing country is considered where female labour supply function is determined as a collective household decision and it depends not only on male and female wages but also on the power distribution in the households. The effect of power distribution on female labour supply depends on the relative marginal utilities of men and women with respect to women’s household work. It is also considered that the earnings differential between men and women is not only the outcome of gender wage inequality but differences in their labour force participation as well. In this scenario, a comparative static analysis shows that a reduction in the rate of tariff may lead to fall in female labour force participation and widening of gender earning inequality if:
the agricultural sector is more male labour intensive than the informal sector and the marginal utility of the woman from household work is higher than that of the man; or

the agricultural sector is more female labour intensive than the informal sector and the man’s marginal utility of the woman’s household work is higher.

Thus, the impact of trade liberalization depends on the relative factor intensity conditions and the relative work preferences of women. On the other hand, policies to empower women might raise female labour force participation and reduce gender earning inequality if the marginal utility of the woman’s household work is higher to the man than the woman, irrespective of factor intensity conditions.

The above results might be helpful in explaining the declining female labour force participation in India in the recent years. Apart from the different reasons identified in the existing literature, the factor intensity condition and work preference of women might also explain the falling FLFP in India. According to Census data, in 2011, 49.8 per cent of males and 65.1 per cent of females were engaged in agriculture (as cultivators and agricultural labourers) while 50.1 per cent of males and 34.9 per cent of females were employed in non-farm sector and household industry (Motkuri and Naik, 2016), indicating that agriculture is more female labour intensive in India. Second, there are evidences to confirm the conservative attitude in the Indian society regarding women’s outside work. Lahoti and Swaminathan (2013) suggest that:

[...] in traditional societies where the man is accorded the role of providing for the family, women’s relative absence in the labour market could well reflect both their and the household’s preferences.

Social stigma is often attached to women’s work that requires interaction with the outside world (Abraham, 2013). Olsen and Mehta (2006) demonstrate a “housewifesation” process for certain groups of women driven by increasing household incomes and cultural norms.

Thus, in the Indian case, the higher female labour intensity in agricultural sector coupled with the work preference pattern of women vis-à-vis men might have a role in the declining female labour force participation. Institutional initiatives for empowerment of women may be effective in raising women’s participation in work and ameliorating gender earning inequality.

Notes

1. Recently, there has been increasing interest in the relationship between social norms and female labour force participation (Hazan and Maoz, 2002; Vendrik, 2003; Burda et al., 2007; Goksel, 2012).

2. There is no skill differentiation between gendered labour. However, the different markets for male and female labour arise from the fact that male and female workers perform different work, maybe due to occupational segregation.

3. There are two justifications for assuming that only male labour in the formal sector is unionised. First, women account for a very small fraction of trade union membership (Venkata Ratnam and Jain, 2002). Only about 6 per cent of women employed work in the formal sector with social benefits (Government of India, 2013). Second, the recent phenomenon in the post liberalisation period whereby even formal sector employs labour on an informal basis to avoid the obligations of minimum wage laws and unionisation involve mainly women workers. With free entry and exit, the flexibility is convenient for women, and it also provides a cost saving competitive edge for the firms.

4. As the formal sector wage, $\bar{W}$ is institutionally fixed, it cannot affect relative wages per se and hence does not feature in the female labour supply function.

5. See detailed mathematical derivation in the Appendix.
References


ILO (2013), Global Employment Trends Report, ILO.


Further reading

ILO (2012), *Promoting Gender Equality for Decent Employment*, ILO.


Appendix

Total differentiation of equations (12), (13) and (14) and use of envelope conditions yields:

\[
\theta_{M1} \hat{W}_M + \theta_{F1} \hat{W}_F + \theta_{K1} \hat{r} = 0 \tag{A.1}
\]

\[
\theta_{M2} \hat{W}_M + \theta_{F2} \hat{W}_F + \theta_{K2} \hat{r} = 0 \tag{A.2}
\]

\[
\theta_{F3} \hat{W}_F + \theta_{K3} \hat{r} = T \hat{t} \tag{A.3}
\]

where: \( T = \left( \frac{t}{1+t} \right) > 0. \)

It may be noted that producers in each industry choose techniques of production so as to minimize unit costs. This leads to the condition that the distributive-share weighted average of changes in input-output coefficients along the unit isoquant in each industry must vanish near the cost-minimization point. This states that an isocost line is tangent to the unit isoquant. In mathematical terms, for example, cost minimization condition in Sector 1 may be written as: \( \theta_{M1} \hat{W}_M + \theta_{F1} \hat{W}_F + \theta_{K1} \hat{r} = 0. \) These are called the envelope conditions. See Caves et al. (1990) and/or Chaudhuri and Mukhopadhyay (2009).

Solving equation (A.1), (A.2) and (A.3) by Cramer’s rule, it follows that:

\[
\hat{W}_M = \left( T \hat{t} / |\theta| \right) (\theta_{F1} \theta_{K2} - \theta_{K1} \theta_{F2}) \tag{A.4}
\]

\[
\hat{W}_F = \left( T \hat{t} / |\theta| \right) (\theta_{K1} \theta_{M2} - \theta_{M1} \theta_{K2}) \tag{A.5}
\]

\[
\hat{r} = \left( T \hat{t} / |\theta| \right) (\theta_{M1} \theta_{F2} - \theta_{F1} \theta_{M2}) \tag{A.6}
\]

where \( |\theta| = \theta_{K3}(\theta_{M1} \theta_{F2} - \theta_{F1} \theta_{M2}) + \theta_{F3}(\theta_{K1} \theta_{M2} - \theta_{M1} \theta_{K2}) \tag{A.7} \)

Now let \( S_{ik} \) be the degree of substitution between factors in the \( i \)th sector, \( i = 1, 2, 3 \), for example, in Sector 1, \( S_{1, F} = (\partial a_{F1}/\partial W_P)(W_P/a_{F1}) \), \( S_{1, M} = (\partial a_{F1}/\partial W_M)(W_M/a_{F1}) \) and so on; \( S_{jk}^i > 0 \) for \( j \neq k \) and \( S_{ij} < 0 \). It should be noted that as the production functions are homogeneous of degree one, the factor coefficients, \( a_{ij} \), are homogeneous of degree zero in the factor prices. Hence, the sum of elasticities for any factor of production in any sector with respect to factor prices must be zero. For example, in Sector 2, with respect to female labour-output coefficient we have, \( (S_{2, F}^2 + S_{2, M}^2 + S_{2, K}^2) = 0 \) and so on. As it is assumed that the capital-output ratio in sector 1 \( (a_{K1}) \) is constant, it implies that \( S_{1, K}^1 = S_{1, KM} = S_{1, KK} = 0. \)

Total differentiation of equation (11) gives:

\[
\delta \hat{\delta} = \delta_1 \hat{e} \hat{e} + \delta_2 (W_F/W_M) (\hat{W}_F - \hat{W}_M) + \delta_3 \hat{\delta} \hat{\delta} \tag{A.8}
\]

Differentiation of equation (10.1), use of equation (A.8) and simplification yields

\[
e\hat{e}(1 - e_1 \delta_1) = \hat{W}_F \{ (e_1 \delta_2 (W_F/W_M) + e_2 W_F) - e_1 \delta_2 (W_F/W_M) - e_3 W_M \} + e_1 \delta_2 \hat{\delta} \hat{\delta} \tag{A.9}
\]

Now, differentiation of equation (15), (16) and (17) and use of equations (A.4) - (A.9) gives:
\[
\lambda_{M1}\dot{X}_1 + \lambda_{M2}\dot{X}_2 + \lambda_{M3}\dot{X}_3 = A_1 T \hat{t} \tag{A.10}
\]

\[
\lambda_{K1}\dot{X}_1 + \lambda_{K2}\dot{X}_2 + \lambda_{K3}\dot{X}_3 = -A_2 T \hat{t} \tag{A.11}
\]

\[
\lambda_{F1}\dot{X}_1 + \lambda_{F2}\dot{X}_2 + \lambda_{F3}\dot{X}_3 = -A_3 T \hat{t} + A_4 \delta \tag{A.12}
\]

Solving equation (A.10), (A.11) and (A.12) by Cramer’s rule yields:

\[
\dot{X}_3 = (1/\Delta) \left[ T \hat{t} \{ A_3 (\lambda_{M2} \lambda_{K1} - \lambda_{M1} \lambda_{K2}) + A_2 (\lambda_{M1} \lambda_{F2} - \lambda_{F1} \lambda_{M2}) \\
+ A_1 (\lambda_{K1} \lambda_{F2} - \lambda_{F1} \lambda_{K2}) \} + Ne_1 \delta \delta (\lambda_{M1} \lambda_{K2} - \lambda_{M2} \lambda_{K1}) \right] \tag{A.13}
\]

where:

\[
A_1 = -(1/|\theta|) \left[ |\theta|^{12}_{FK} (\lambda_{M1} S^3_{MM} + \lambda_{M2} S^2_{MM}) + |\theta|^{12}_{KM} (\lambda_{M1} S^3_{MF} + \lambda_{M2} S^2_{MF} + \lambda_{M3} S^3_{MF}) \\
+ |\theta|^{12}_{MF} (\lambda_{M2} S^2_{MK} + \lambda_{M3} S^3_{MK}) \right];
\]

\[
A_2 = (1/|\theta|) \left[ |\theta|^{12}_{FK} \lambda_{K2} S^2_{KK} + |\theta|^{12}_{KM} (\lambda_{K2} S^2_{KK} + \lambda_{K3} S^3_{KK}) + |\theta|^{12}_{MF} (\lambda_{K2} S^2_{KK} + \lambda_{K3} S^3_{KK}) \right];
\]

\[
A_3 = (1/|\theta|) \left[ |\theta|^{12}_{FK} \{ \lambda_{F1} S^3_{FM} + \lambda_{F2} S^2_{FM} + \lambda_{F3} S^3_{FM} + (M/y)((W_F/W_M)e_1 \delta_2 - e_3 W_M) \} \\
+ |\theta|^{12}_{KM} (\lambda_{F1} S^3_{FM} + \lambda_{F2} S^2_{FM} + \lambda_{F3} S^3_{FM} - (M/y) W_F((e_1 \delta_2/W_M) + e_2) \} \\
+ |\theta|^{12}_{MF} (\lambda_{F2} S^2_{FK} + \lambda_{F3} S^3_{FK}) \right];
\]

\[
A_4 = Ne_1 \delta \delta;
\]

\[
y = (1 - e_1 \delta_1) > 0;
\]

\[
\Delta = \lambda_{M1} (\lambda_{K2} \lambda_{F3} - \lambda_{K3} \lambda_{F2}) - \lambda_{M2} (\lambda_{K1} \lambda_{F3} - \lambda_{K3} \lambda_{F1}) + \lambda_{M3} (\lambda_{K1} \lambda_{F2} - \lambda_{F1} \lambda_{K2})
\]

\[
= \lambda_{K1} (\lambda_{M3} \lambda_{F2} - \lambda_{M2} \lambda_{F3}) - \lambda_{K2} (\lambda_{M3} \lambda_{F1} - \lambda_{M1} \lambda_{F3}) + \lambda_{K3} (\lambda_{M2} \lambda_{F1} - \lambda_{M1} \lambda_{F2}) \tag{A.15}
\]

Here $|\theta|^{12}_{ij}$ denotes $(\lambda_{i1} \lambda_{j2} - \lambda_{i2} \lambda_{j1})$ and $|\theta|^{12}_{ij}$ implies $(\theta_{i1} \theta_{j2} - \theta_{i2} \theta_{j1})$.

Differentiation of equation (18) yields:

\[
W_A \dot{W}_A = \dot{W}_M W_M (1 - \lambda_{M3}) + (W_M - W_M) \left[ \lambda_{M3} \left( \dot{X}_3 + S^3_{MF} \dot{W}_F + S^3_{MK} \dot{r} \right) \right] \tag{A.16}
\]

Total differentiation of equation (19) and use of equations (A.5), (A.9) and (A.16) gives:
\[ \hat{W}_I = \hat{W}_M \left[ W_M (1 - \lambda_{M3} - e_3 W_F) + W_F \left\{ (e_1 \delta_2/y)(W_F/W_M) \right\} \right] \\
- W_F W_F \left[ e + (e_1 \delta_2/y)(W_F/W_M) + \left\{ (\bar{W}_M - W_M) \lambda_{M3} S_{MF}^3 / W_F \right\} + e_2 W_F \right] \\
+ (\bar{W}_M - W_M) \lambda_{M3} \left( \bar{X}_3 + S_{MK}^3 \right) \]  

(A.17)

**Effect of tariff cut**

It is assumed that \( t < 0 \).

Using equations (A.14) and (A.15) in (A.13) and simplifying we get:

\[ \hat{X}_3 = \left( \frac{T \dot{t}}{\Delta |\theta|} \right) B \]  

(A.13.1)

where,

\[ B = \left\{ \theta_{K2}(\theta_{M1} + \theta_{F1}) - \theta_{K1}(\theta_{M2} + \theta_{F2}) \right\} \lambda_{M1} |\lambda|_{MK}^{12} S_{MM}^3 \]

\[ + \lambda_{KM}^{12} \left( \lambda_{FM} S_{KM}^2 + (N/y)(W_F/W_M)e_1 \delta_2 - \lambda_{F2} |\lambda|_{KM}^{12} S_{FF}^2 \right) \]

\[ + \lambda_{K2} |\lambda|_{MF}^{12} S_{FK}^3 - \lambda_{M2} |\lambda|_{MK}^{12} S_{MK}^3 \}

\[ - \theta_{F1}(\theta_{K2} + \theta_{M2}) \left( \lambda_{M2} |\lambda|_{MK}^{12} S_{MK}^3 + \lambda_{F2} |\lambda|_{MK}^{12} S_{MK}^3 \right) \]

\[ + \lambda_{K2} |\lambda|_{MF}^{12} S_{KK}^3 \left( |\theta|_{MF}^{12} - |\theta|_{MK}^{12} \right) \]

\[ + \lambda_{M1} (\lambda_{M3} |\lambda|_{MK}^{12} S_{MM}^3 - \lambda_{K2} \lambda_{F3} S_{FK}^3) \]

\[ - \lambda_{F1} \left( \lambda_{K3} \lambda_{M2} S_{KK}^3 - \lambda_{K2} \lambda_{M3} S_{MK}^3 \right) \]

\[ - \lambda_{K1} \left( \lambda_{M3} \lambda_{F2} S_{MK}^3 - \lambda_{M2} \lambda_{F3} S_{FK}^3 \right) \}

\[ - |\theta|_{KM}^{12} \{ (N/y) W_F e_2 - \lambda_{F3} S_{FK}^3 \}

\[ + |\theta|_{MF}^{12} \lambda_{MK} |\lambda|_{MK}^{12} \}

\[ + |\theta|_{FK}^{12} \{ \lambda_{F3} S_{FM}^3 - (N/y) e_3 W_M \} \}

Use of equations (A.4), (A.5), (A.6), (A.9) and (A.13.1) in (A.17) yields:

\[ \hat{W}_I = \left( \frac{T \dot{t}}{|\theta| \Delta} \right) \{ p - q + s \} \Delta + B \]  

(A.17.1)

where,

\[ p = |\theta|_{FK}^{12} \left\{ W_M (1 - \lambda_{M3} - e_3 W_F) + (W_F/y) e_1 \delta_2 (W_F/W_M) \right\} \]

\[ q = W_F |\theta|_{KM}^{12} \left\{ e + (e_1 \delta_2/y)(W_F/W_M) + (\bar{W}_M - W_M) (\lambda_{M3}/W_F) S_{MF}^3 + e_2 W_F \right\} \]

\[ s = \left\{ (\bar{W}_M - W_M) \lambda_{M3} S_{MK}^3 |\theta|_{MF}^{12} \right\} \]

As Sector 2 is more capital-intensive vis-à-vis sector 1 with respect to labour (male and female), we have \( \theta_{K2}(\theta_{M1} + \theta_{F1}) > \theta_{K1}(\theta_{M2} + \theta_{F2}) \Rightarrow |\theta|_{MK}^{12} > 0 \) and \( |\theta|_{FK}^{12} > 0 \).
We consider two alternative factor intensity conditions with respect to male and female labour in Sectors 1 and 2.

**Case I:** \( \theta_{M1}\theta_{F2} > \theta_{F1}\theta_{M2} \Rightarrow |\theta|^3_{MF} = |\theta| > 0 \) and \( \Delta < 0 \) [from equations (A.7) and (A.15), respectively].

From equations (A.5) and (A.6), it follows that \( \hat{W}_M < 0 \) and \( \hat{W}_F > 0 \).

Hence male–female wage gap = \( (\hat{W}_M - \hat{W}_F) < 0 \)

- Let \( e_1 > 0 \)

From equation (A.13.1), one gets:

\[
\hat{X}_3 < 0 \text{ if (i) } S^3_{MK} > S^3_{FK} \text{ and (ii) } \theta_{F2}(\theta_{M1} + \theta_{K1}) > \theta_{F1}(\theta_{M2} + \theta_{K2})
\]

\[\text{(A.18)}\]

From (A.9) we have \( \hat{e} > 0 \). \[\text{(A.19)}\]

By using equation (A.13.1) in (A.17.1), we get \( \hat{W}_I < 0 \), if condition equation (A.18) holds.

- Let \( e_1 < 0 \)

From equation (A.13.1), one gets:

\[
\hat{X}_3 < 0 \text{ if (i) } \lambda_{F1}S^3_{FM} > (M/y)(W_F/W_M)e_1\delta_2 \text{ and (ii) } (A.18) \text{ holds}
\]

From (A.9) we have \( \hat{e} < 0 \) if \( e_3W_M < e_1\delta_2(W_F/W_M) > e_2W_F \).

\[\text{(A.20)}\]

From equation (A.17.1), we get \( \hat{W}_I > 0 \) if:

\[
\text{(i) } (A.20) \text{ holds}
\]

\[
\text{(ii) } |W_M(1 - \lambda_{M3} - e_3W_F)| < \left| (W_F/y)e_1\delta_2(W_F/W_M) \right| > \left[ (\overline{W}_M - W_M)(\lambda_{M3}/W_F)S^3_{MF} + e_2W_F) \right]
\]

\[
\text{(iii) } (p + q)\Delta > s\Delta + B
\]

\[\text{(A.22)}\]

**Case II:** \( \theta_{M1}\theta_{F2} < \theta_{F1}\theta_{M2} \Rightarrow |\theta|^3_{MF} = |\theta| < 0 \) and \( \Delta > 0 \) [from equations (A.7) and (A.15)] respectively.

From equations (A.5) and (A.6), it follows that \( \hat{W}_M > 0 \) and \( \hat{W}_F < 0 \).

Therefore, male–female wage gap = \( (\hat{W}_M - \hat{W}_F) > 0 \)

- Let \( e_1 > 0 \)

From equation (A.13.1), one gets:

\[
\hat{X}_3 < 0 \text{ if (i) } S^3_{MK} < S^3_{FK}
\]

\[
\text{(ii) } \lambda^2_{MF}\lambda_{M3}S^3_{MF} > \lambda^2_{MF}\lambda_{K3}S^3_{KF} \text{ and (iii) } \theta_{M2}(\theta_{F1} + \theta_{K1}) > \theta_{M1}(\theta_{F2} + \theta_{K2})
\]

\[\text{(A.23)}\]
From (A.9) we have $\dot{e} < 0$.  \hfill (A.24)

From (A.17.1) we get $\dot{W}_I > 0$ if (i) (A.23) holds and (ii) $(\rho + q)\Delta > s\Delta + B$.  \hfill (A.25)

Effect of exogenous rise in power of women

It is assumed that $\tilde{\sigma} > 0$.

Case I: $\theta_{M1} \theta_{F2} > \theta_{F1} \theta_{M2} \Rightarrow |\theta|_{MF}^{12} = |\theta| > 0$ and $\Delta < 0$.

From equations (A.4) and (A.5), it follows that $\dot{W}_M = \dot{W}_F = 0$.

Hence male–female wage gap $= (\dot{W}_M - \dot{W}_F) = 0$.

From equation (A.13), it follows that:

$$\dot{X}_3 = (1/\Delta) \left[ Ne_1 \delta_3 \delta \left( \lambda_{M1} \lambda_{K2} - \lambda_{M2} \lambda_{K1} \right) \right]$$  \hfill (A.13.2)

Let $e_1 > 0$

From equation (A.13.2), it is evident that $\dot{X}_3 < 0$.

From equation (A.9), it follows that $\dot{e} > 0$.

Substitution of equations (A.13.2) in (A.17) gives:

$$\dot{W}_I = (1/\Delta(1 - e_1 \delta_1))e_1 \delta_3 \tilde{\sigma} \left[ N(\lambda_{M1} \lambda_{K2} - \lambda_{M2} \lambda_{K1})(\overline{W}_M - W_M) \lambda_{M3}(1 - e_1 \delta_1) - \Delta W_F \right]$$  \hfill (A.29)

From equation (A.29), we have $\dot{W}_I < 0$.

Let $e_1 < 0$

From equation (A.13.2), it follows that $\dot{X}_3 > 0$.

From equation (A.9), it follows that $\dot{e} < 0$.

Equation (A.29) yields that $\dot{W}_I > 0$.

Case II: $\theta_{M1} \theta_{F2} < \theta_{F1} \theta_{M2} \Rightarrow |\theta|_{MF}^{11} = |\theta| < 0$ and $\Delta > 0$.

Here again male–female wage gap $= (\dot{W}_M - \dot{W}_F) = 0$.

Let $e_1 > 0$
From equation (A.13.2), it is evident that $\dot{X}_3 > 0$.

From equation (A.9), it follows that $\dot{e} > 0$.

From (A.29) we have $\dot{W}_I < 0$ if $\Delta W_F > N(\lambda_{M1}\lambda_{K2} - \lambda_{M2}\lambda_{K1})(\overline{W}_M - W_M)\lambda_{M3}(1 - \epsilon_1 \delta_1)$

(A.30)

• Let $\epsilon_1 < 0$

From equation (A.13.2), it follows that $\dot{X}_3 < 0$.

From equation (A.9), it follows that $\dot{e} < 0$.

Equation (A.29) yields that $\dot{W}_I > 0$ if equation (A.30) holds.

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